further in view of Katoh (U.S. Patent No. 5,134,451). Claims 28-35 and 43-56 were rejected under 35 U.S.C.§103(a) as being unpatentable over Sasaki et al (Jap. Pat. No. 9-266306) or Hah et al (Jap. Pat. No. 9-186102) taken with Chiang (U.S. Pat. No. 5,817,572) and further in view of Fleming et al and Agnello et al. Claims 9-12, 13-16, 24 and 27 were rejected under 35 U.S.C. §112, second paragraph, as being indefinite.

In canceling Claims 28-62 and adding claims 63-88, new independent Claims 63, 68, and 72 correspond to former Claims 43, 48, and 52 respectively. Further, new independent Claims 79-80 and 88 include similar limitations as Claims 63, 68, and 72 and relate to forming WSi and WSiN films.

Methods of forming a wire structure of a semiconductor device are defined in the newly added claims. Applicants submit that these methods are not specifically described in the applied art references.

For example, one difference between the present invention and Fleming et al is that, in Fleming et al, a method of forming WSiN is performed in a single step in which a film is formed at a pressure between 500 mTorr and 700 mTorr. In contrast, in the present invention of independent Claims 63, 68, 72, 79-80, and 88, a WSiN film is formed at pressures higher than 700 mTorr. Another difference is that, in the method of Fleming et al, a WSiN film is formed using WF_6, Si_2H_6 (disilane), and NH_3. Fleming et al describe that no "significant amounts of Si are incorporated into the films when using SiH_4 ..."[1] Further, Fleming et al describe that

> ...The experimenters were unable to incorporate any silicon into the film using silane as a reductant. The films grown by silane reduction, in the present of NH_3, typically had a stoichiometry corresponding to WN_2.[2]

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[1]Fleming et al, column 4, lines 67 to column 5, line 1.

[2]Id., column 6, lines 53 to 56.

Thus, WN_2 films grown in Fleming et al are not formed, as defined in Claims 63, 68, 72, 79-80, and 88, using WF_6, H_2, and NH_3. Further, the WSiN films of Fleming et al are not formed using WF_6, SiH_4, and a nitrogen-containing gas, as defined in Claims 63, 68, 72, 79-80, and 88. In short, the film formation method of the present invention invokes different reactants and hence differs from Fleming et al.

The other art references applied to former Claims 43, 48, and 52 (i.e. Sasaki et al, Hah et al, Chiang, and Agnello et al) are deemed no more relevant to the present invention of Claims 63, 68, 72, 79-80, and 88 than the applied prior art reference of Fleming et al. For example, Sasaki et al disclose the formation of a WSiN film using Si_2H_6 as shown in Figure 4. Hah et al disclose the formation of a WN film, but only at low pressures (i.e. at 0.1 Torr), and provide no disclosure for forming a WSiN film.[3] Chiang et al disclose the formation of barrier layers of TiN, W, Ta, TiW, TaSiN, and WN, Nb, or Mo, but not WSiN.[4] There is no disclosure in Chiang et al as to a method of forming the WN. Agnello et al disclose a CMOS gate stack structure using a metal-silicon-nitrogen diffusion barrier which could include W.[5] However, there is no disclosure in Agnello et al for a method of forming WN or for using SiH_4 to deposit a WSiN film.

Hence, the applied art references do not teach or suggest forming a WN film by a thermal CVD process at pressures from 0.5-80 Torr, forming a WN film by nitriding a W film, forming a WSiN film at pressures equal or higher than 700 mTorr by using WF_6, SiH_4, and a nitrogen-containing gas, or by forming a WSiN film by nitriding a WSi film, as defined in the independent Claims. Indeed, the prior art references as a whole teach away from the

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[3]Hah et al, col. 3, lines 35-40.

[4]Chiang et al, col. 13, lines 59-64.

[5]Agnello et al., Abstract.

independent Claims in that the use of SiH_4 as a reactant gas is not utilized (as in Sasaki et al) or does not produce Si incorporation (as in Fleming et al).

Thus, independent Claims 63, 68, 72, 79-80, and 88, and the remaining dependent Claims which depend directly or indirectly from the independent claims are not obvious and are believed to patentably define over the prior art.

Consequently, in view of the present amendment and in light of the above discussions, the outstanding grounds for rejection are believed to have been overcome. The application as amended herewith is believed to be in condition for formal allowance. An early and favorable action to that effect is respectfully requested.

Respectfully submitted,

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IN THE CLAIMS

Claims 28-62 are canceled.

Claims 63-88 (New).